PFAS Investigation at a Rural Naval Airfield

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MIDLANT

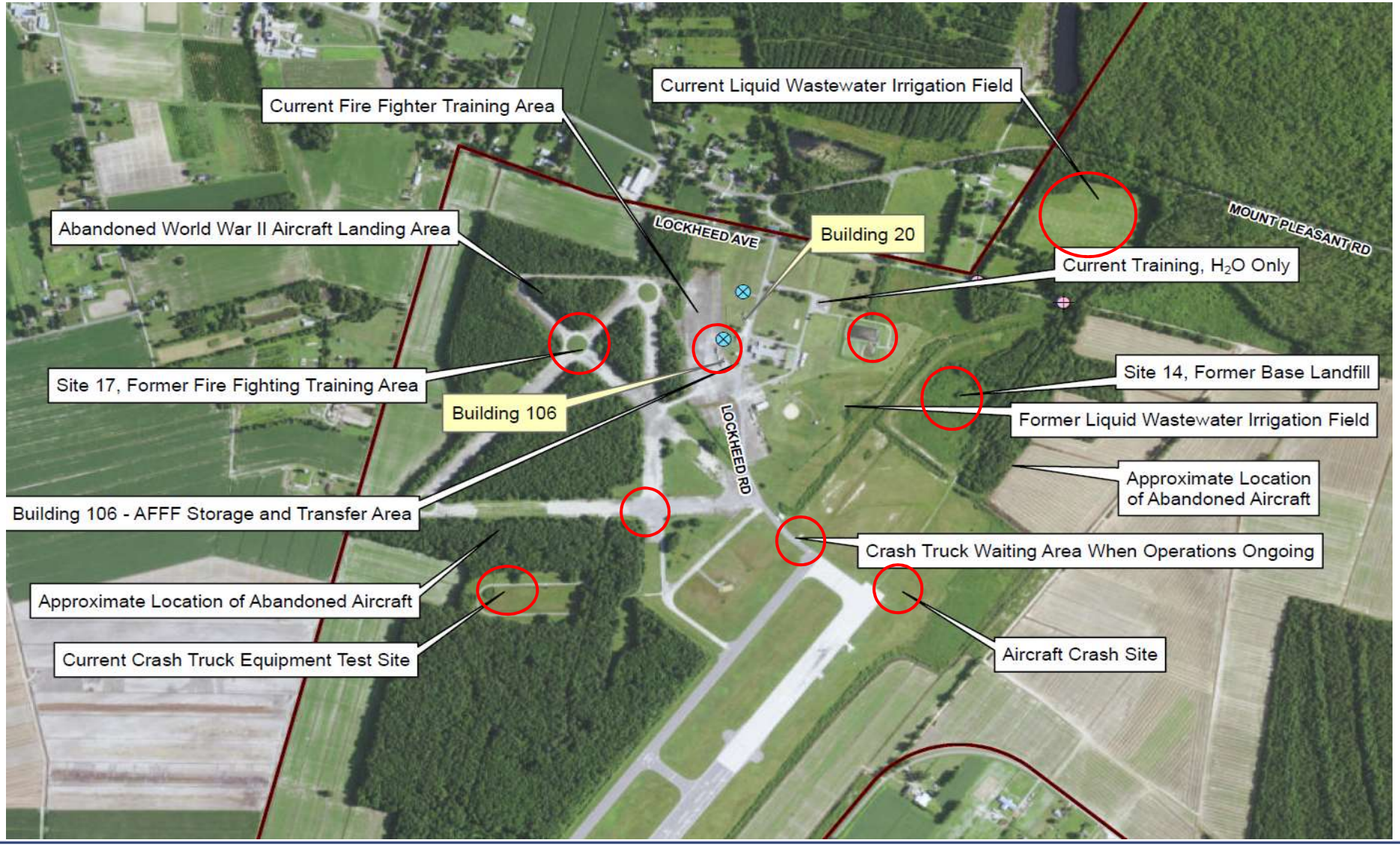
Objective

- **Present Case Study of a Rural Naval Airfield**
  - **Present site history**
  - **Review Conceptual site model**
  - **Overview of treatments installed to address PFAS**
- **General Conclusions and Take Aways**
  - **Science**
  - **RPM**
- **Questions**

Background

- Outlying landing field
- Staffed by 40 military personnel
- Two groundwater supply wells provide water (potable and non-potable) on-base
- Former drinking water treatment involves green sand filters, permanganate oxidation, water softening, and chlorination
- Wastewater treatment through a series of settling lagoons and used for spray irrigation on-site
- Surrounding residents use private wells for potable and non-potable purposes

Initial PFAS Investigation



Initial On-Base Findings – Groundwater

- **Exceedances in Surficial Aquifer monitoring wells:**
  - **Crash Truck Test Area**
    - **PFOS – 11,000 ng/L**
    - **PFOA – 320 ng/L**
  - **Fire-fighting Training Area**
    - **PFOS – 3,000 ng/L**
    - **PFOA – 320 ng/L**
  - **Exceedances in facility boundary wells and wells in irrigation spray field**

Lifetime Health Advisory (LHA) for PFOA + PFOS = 70 ng/L

- **Yorktown Aquifer Monitoring Wells – detections but no exceedances**
- **On-base water supply (raw water and finished drinking water) samples exceeded LHAs and personnel immediately provided bottled water**
- **CONCURRENTLY CONDUCTED EXPEDITED INVESTIGATION ON BASE WHILE PLANNING OFF-BASE CONTIGENCY**

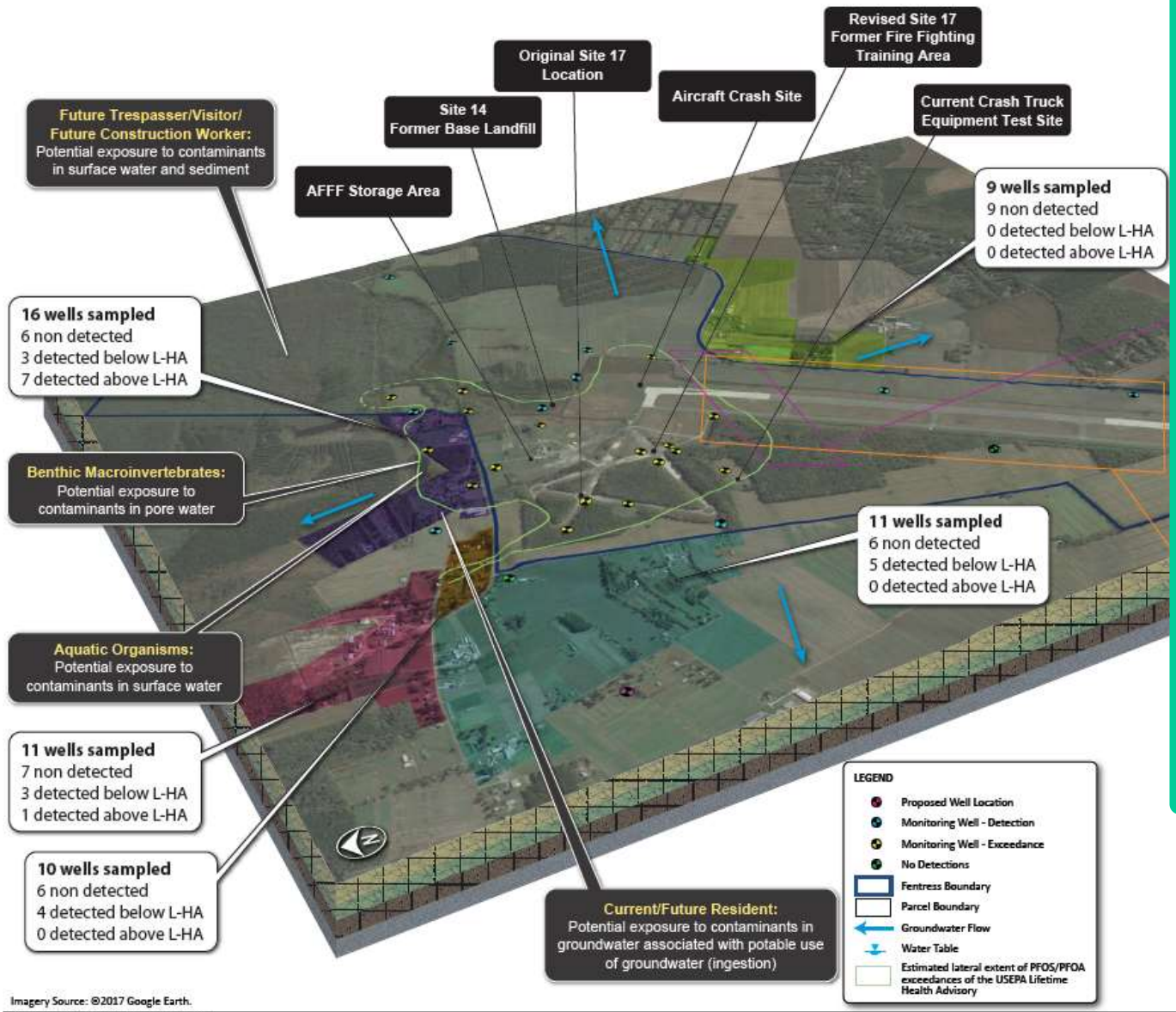
Implementation of Contingency Plan

- Conceptual Site Model (CSM) developed to assess need to test off-site drinking water
- Contingency Off-base drinking water sampling
- Installation of monitoring wells on- and off-base
- Soil and sludge sampling

Rapid Response Actions Off-base Drinking Water

- Water filling station established by local municipality for concerned residents during off-base groundwater sampling
- Residences with exceedances of the PHA and subsequently the L-HA (PFOA + PFOS > 70 ng/L) were immediately supplied with bottled water when results were received (6 properties)

Current CSM



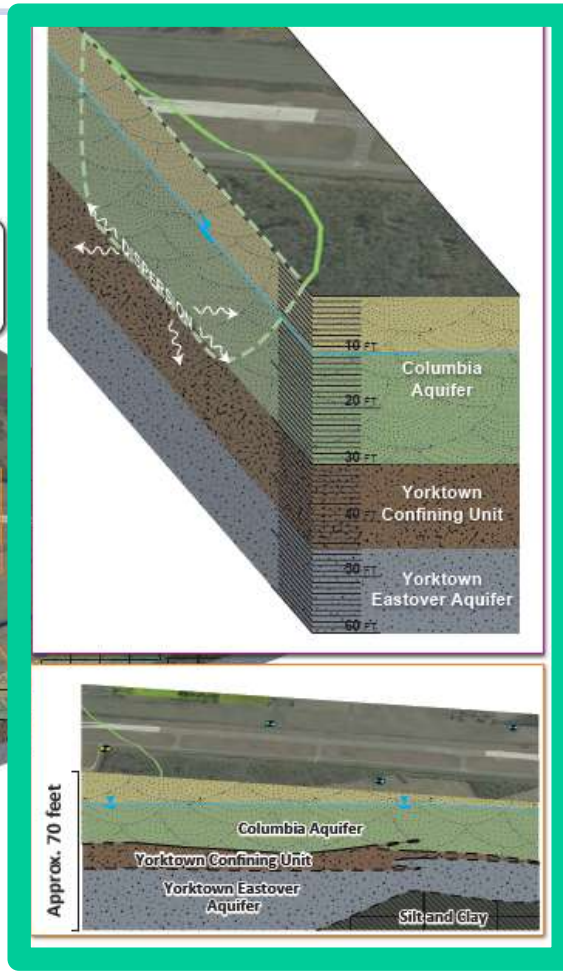
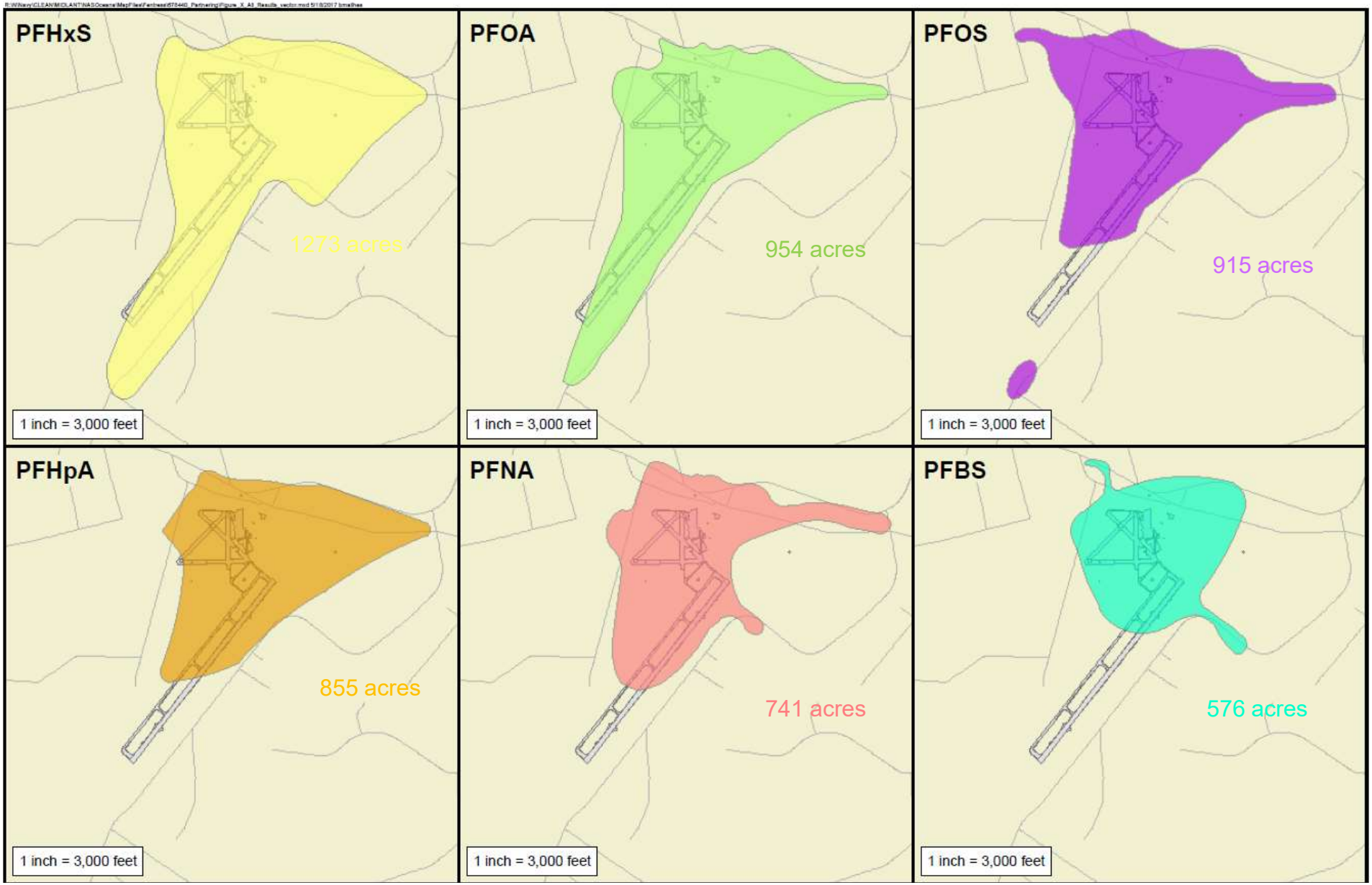


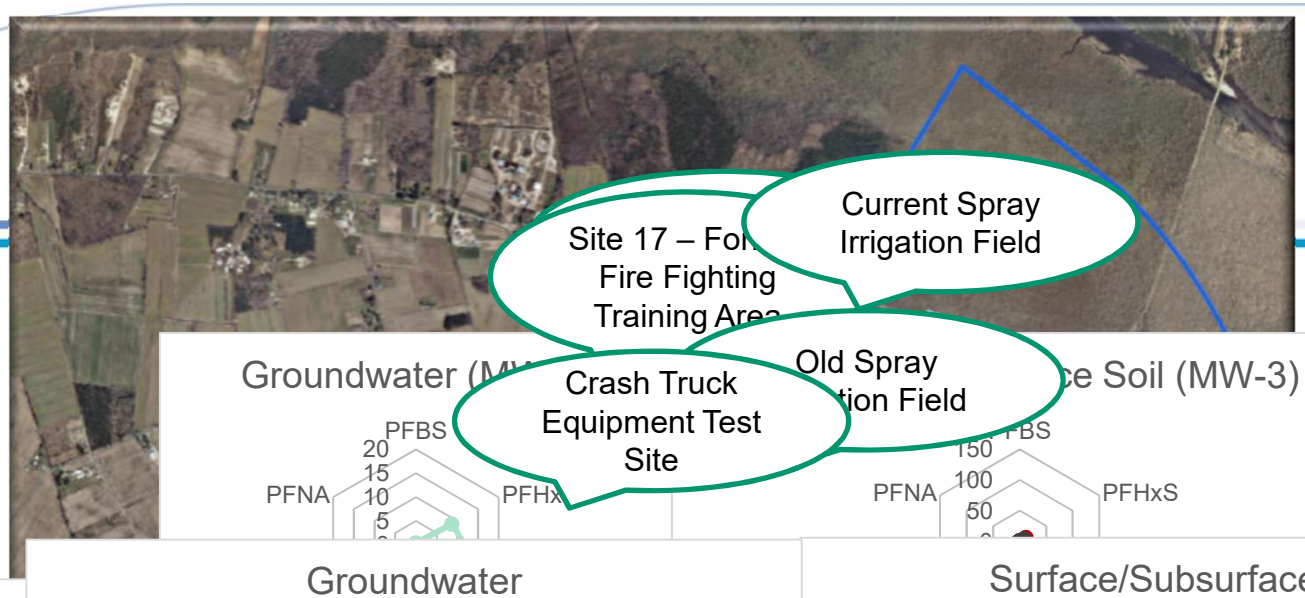
Figure 1
Conceptual Site Model
Basewide Perfluorinated Compound Investigation Sampling and Analysis Plan Addendum 1
NALF Fentress, Chesapeake, Virginia

Distribution of Detected PFAS Concentrations



Primary and Secondary Source Evaluation (Preliminary Fate and Transport)

- **Soil sampling**
  - Fire-fighter training areas
  - Near the supply wells where fire-fighting water has been sprayed
  - Irrigation sprayfields
- **Sludge evaluation**
  - Wastewater storage lagoon



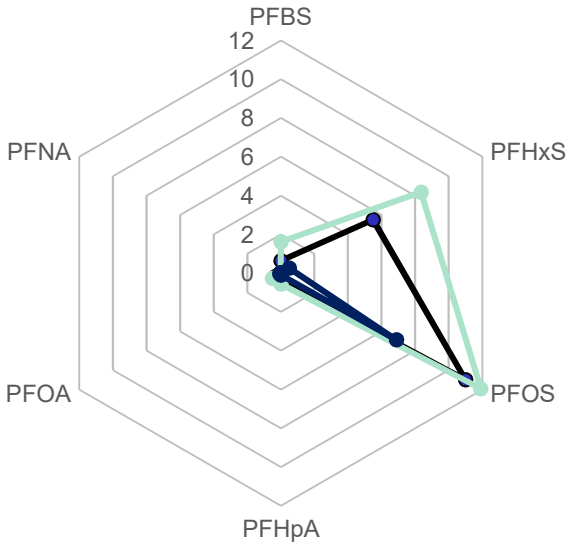
Groundwater (MW

ce Soil (MW-3)

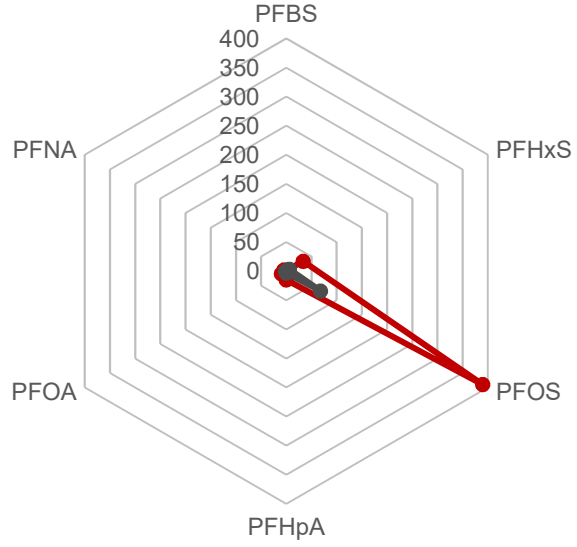
Groundwater

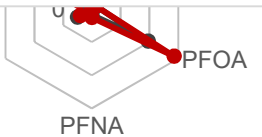
Surface/Subsurface Soil

Groundwater



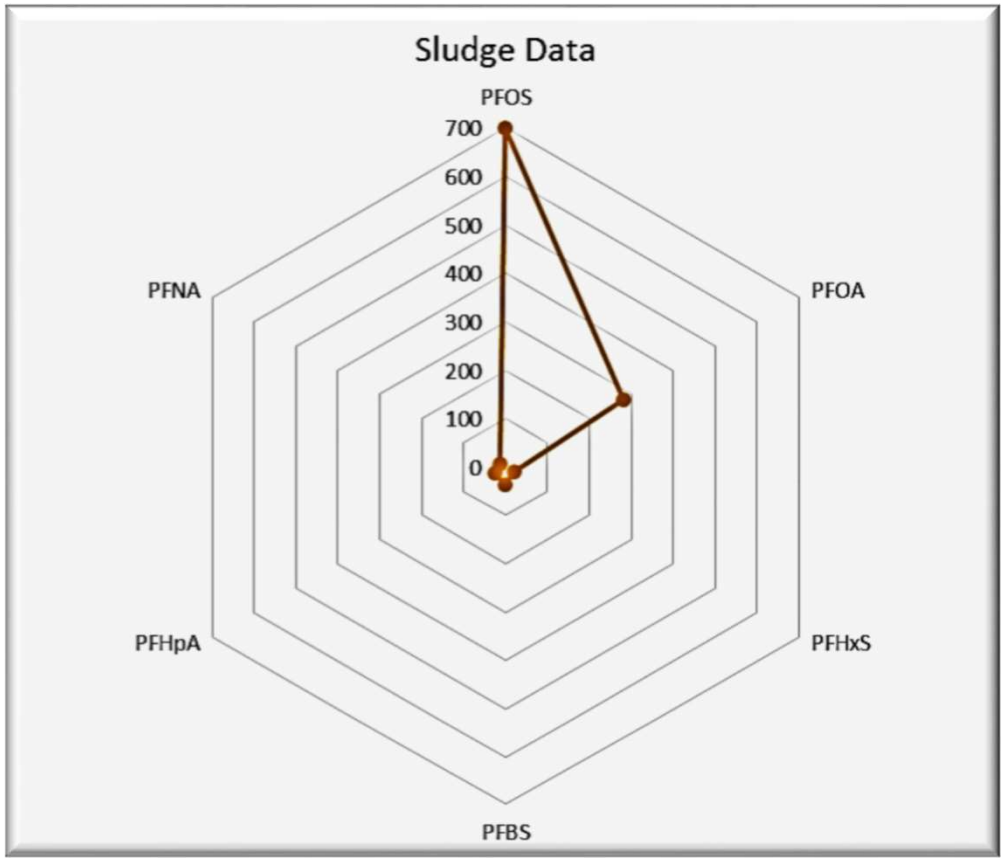
Surface/Subsurface Soil





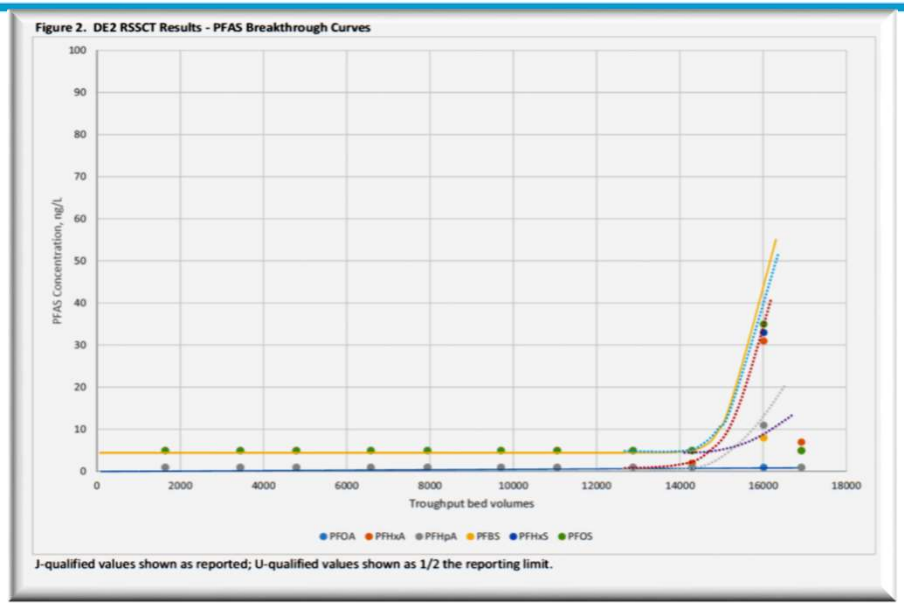
Sludge Test Results

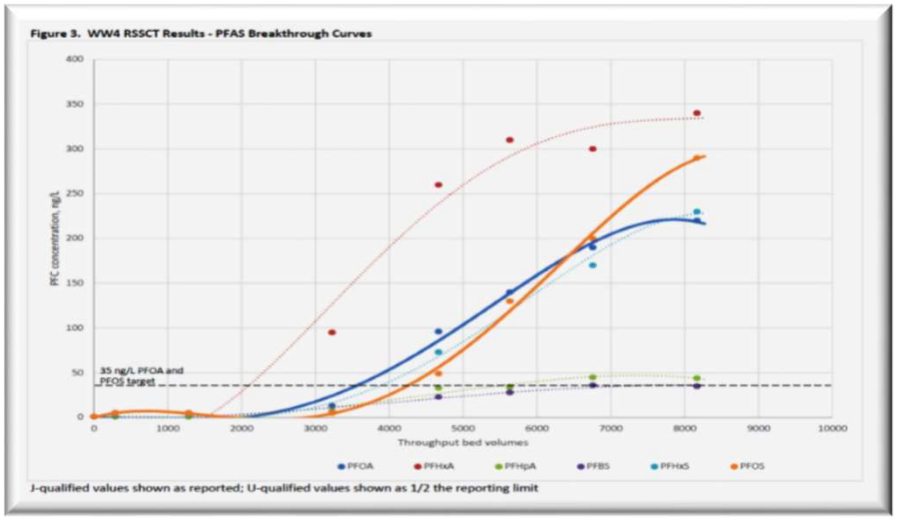
- Highest PFAS concentrations found within sludge of storage lagoon
- Liner replaced ~1 year prior to collection of sludge sample
- PFOS dominates, with lower levels of PFOA observed



Water and Wastewater Treatment Approach

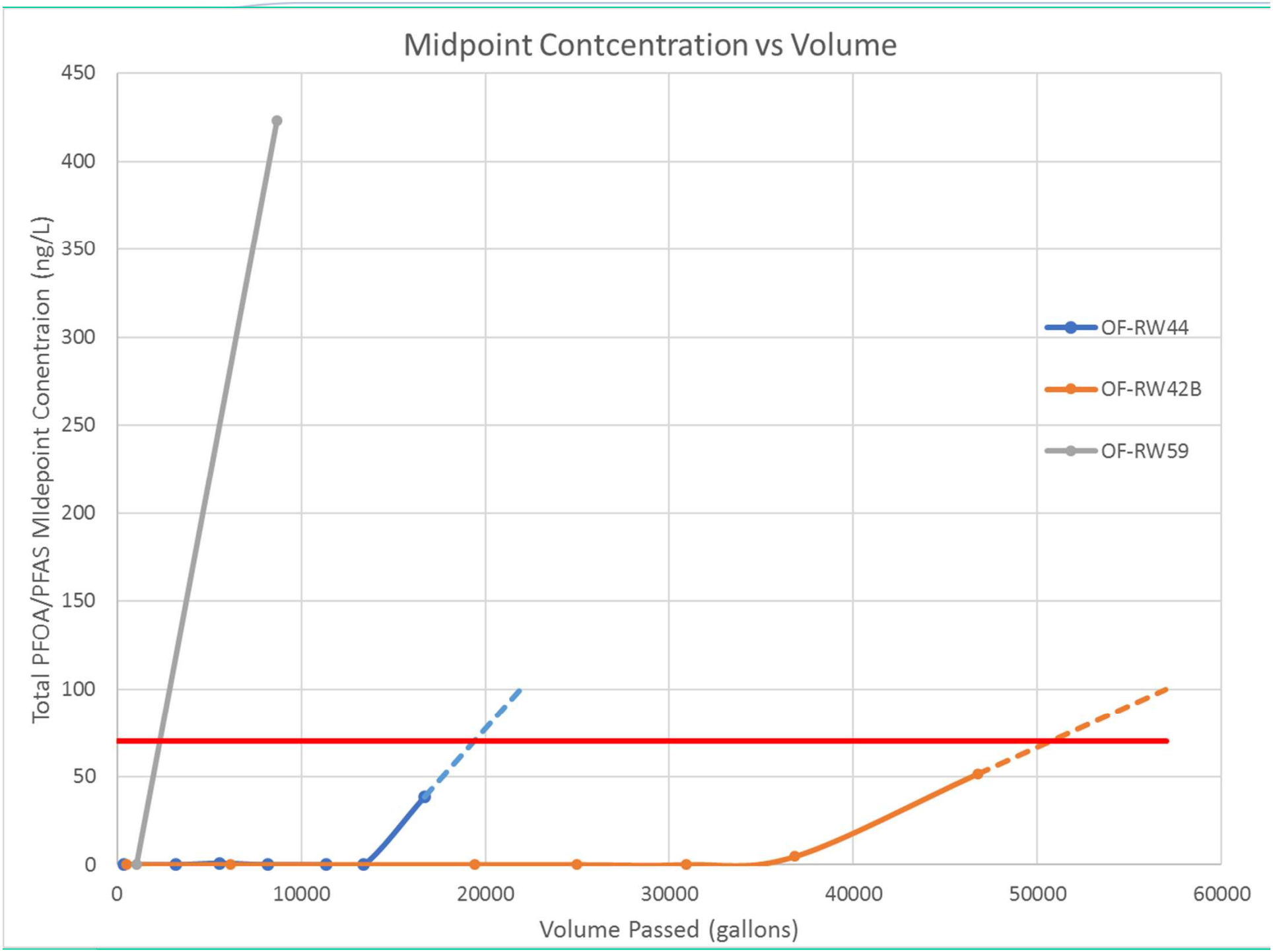
- **GAC selected to treat potable water and wastewater**
- **Treatability for Drinking Water**
  - **Multiple GACs isotherm tested with Rapid Small Scale Column Testing**
  - **Finished drinking water, breakthrough >16,000 bed volumes**
- **Treatability for Wastewater**
  - **Alum and ferric sulfate pretreatment, 50 mg/L alum selected**
  - **Alum pretreatment reduced concentrations of PFOA (22%) and PFOS (56%)**
  - **Breakthrough for wastewater considerably sooner than drinking water due to TOC**





Evaluation of Drinking Water and Wastewater Systems

- **Drinking water system**
  - Used Total Oxidizable Precursor (TOP) assay to assess precursor mass
  - TOP assay PFOA values higher than non-TOP assay PFOA in raw water
  - TOP assay PFOA was greater after permanganate/green sand filter treatment, indicating oxidative transformation of precursors
  - PFOS levels remained fairly consistent throughout treatment system
- **Wastewater system**
  - PFOS levels remained fairly consistent throughout treatment system
  - PFOA levels declined slightly through treatment process and TOP assay suggested some precursor mass remains throughout


Midpoint Contcentration vs Volume
Total PFOA/PFAS MIdepoint Conentraion (ng/L)
450
400
350
300
250
200
150
100
50
0
0
10000
20000
30000
40000
50000
60000
Volume Passed (gallons)
OF-RW44
OF-RW42B
OF-RW59

Treatment System Retrofits

- **Drinking water system**
  - **Designed GAC systems on- and off-base using Filtrasorb 600**

- **Wastewater system**
  - **Sacrificial GAC prior to Filtrasorb 400 treatment**

SCIENCE
General Conclusions and Take-aways

- Numerous PFAS releases identified
- PFAS has significant migration in groundwater
- Significant redistribution has occurred
- Straight drilling wells through confining unit and pumping has contaminated the deeper aquifer
- PFOS is the dominant compound detected in all media
- Filtrasorb bituminous GAC effective for drinking water treatment
- Imminent threat in has been removed

RPM Take-aways

- Create an aggressive plan of action and consistent key messages prior to taking the first sample
  - Work with PAO and NMCPHC risk communicators to develop site-specific Q&As
- Be as open and transparent with the surrounding community as possible
  - PARTNER and utilize available resources such as ATSDR, EPA, state environmental departments, and local public health departments via risk communication sessions and participation in public meetings
  - Educate partners and community on CERCLA process
- Utilize your legal counsel and LANT resources (they can be extremely helpful)
- Prepare yourself for the long haul; this entire process can quickly become overwhelming and cause emotional stress

Knowledge Check

- **What PFAS currently have USEPA lifetime health advisory for drinking water?**

  Answer: PFOA and PFOS (cumulative 70 ppt)

- **How many emerging contaminants are listed on the USEPA "Emerging Contaminants and Federal Facility Contaminants of Concern" webpage?**

  Answer: 13 (1,2,3-TCP, 1,4-dioxane, 2,4,6-TNT, DNT, RDX, nanomaterials, NDMA, perchlorate, PFOS/PFOS, PBBs, PBDEs, and tungsten.

https://www.epa.gov/fedfac/emerging-contaminants-and-federal-facility-contaminants-concern

Contacts and Questions

Points of Contact

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Questions ?